ARTISANAL DIAMOND MINING IN SIERRA LEONE:
SOCIAL IMPACTS, ENVIRONMENTAL AWARENESS AND OPPORTUNITIES FOR CHANGE

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ABSTRACT

More than a decade after a violent, diamond-fueled civil war, Sierra Leone ranks 183 out of 187 countries on the 2014 UNDP Human Development Index; and UNEP warns that their lack of appropriate natural resource-linked governance creates significant risks for instability or conflict. As artisanal diamond mining (ADM) is widespread, affecting nearly 8% of the population, and lucrative, accounting for nearly 38% of diamond exports, it could be a critical driver of prosperity. People in the diamond-mining region are seeking opportunities to improve their economic, social, and environmental wellbeing, and positive repercussions can reach far beyond the rural boundaries of their villages.

Unfortunately, typical ADM techniques are dangerous, often illicit, and cause deforestation and biodiversity loss. Open, abandoned mining pits span the landscape leaving a wake of depleted soil and unproductive land. There is an interconnected cycle in Sierra Leone whereby poverty largely drives people to artisanal mining, which leads to significant environmental degradation, which reduces livelihood opportunities thus exacerbating poverty. In Sierra Leone, poverty and desperation in the context of corrupt leadership led to a struggle for power and violent conflict; and artisanally mined diamonds – small, valuable, hard to trace – became the illicit currency of the struggle. This cycle is not inevitable, but the conditions create a risky, vulnerable, and urgent positive feedback loop.

Through in-depth interviews in Kono District, Sierra Leone in 2012, this report seeks to understand current environmental awareness, practices, and attitudes of affected populations. Such insights help to identify ideas, interest, and current capacity for small changes at the artisanal mine level to improve the social, economic, and environmental wellbeing of diamond miners and their communities. Analysis reveals seven findings and three critical takeaways: 1) work directly with supporters, 2) employ simple operations interventions, and 3) focus on land rehabilitation from the outset. These efforts can be quickly implemented and scaled in a decentralized manner. As many miners feel a lack of control over their situation, such localized efforts could complement national and international initiatives for development in Sierra Leone.

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INTRODUCTION

Artisanal and small-scale mining (ASM), which supplies 20% of the global diamond trade and 20% of global mining output, could be a powerful force for development (Buxton 2013, 11). A more socially and environmentally sound approach to ASM could affect nearly 13 million people worldwide who do ASM (ILO 2001), and have positive ripple effects for the nearly 100 million people who depend on ASM (ILO 2001) in 70 developing and transition nations (Hruschka and Echavarría 2011, 8). In comparison to other poverty-driven, small-scale livelihoods, ASM is more lucrative to local economies and household income by a factor of three to five (5). Impoverished and largely driven by desperation and lack of opportunity, miners turn to ASM of easily accessible minerals such as such as diamonds, gold, tantalum, zircon. ASM is dangerous, commonly illicit, prone to exploitation, and causes environmental harm that perpetuates poverty and insecurity (Hruschka and Echavarría 2011).

In Sierra Leone, artisanal mining accounts for almost 38% of diamond exports (N.M.A. 2013), and includes as many as 120,000 people (DDI 2011). Despite a history of diamond mining that goes back to the 1930s, mining communities have failed to profit from this natural resource wealth; the country currently ranks 183 out of 187 countries on the 2014 UNDP Human Development Index (UNDP 2014). Finding effective solutions to ASM challenges that Sierra Leone faces could have implications for significantly larger populations around the world.

Typical ASM techniques cause deforestation and biodiversity loss, while abandoned mines breed disease and leave land unproductive. Diamonds are enormously valuable, easily hidden, and nearly impossible to trace. Widespread, near-surface mineral deposits and low barriers to entry make efforts to regulate ASM largely ineffective. Taken together, these characteristics lead to smuggling of high value natural resources, leading to insecurity and federal tax revenue loss.

In Sierra Leone, this points to a complex, systemic connection[1] among poverty, artisanal diamond mining (ADM), environmental degradation, and conflict. Whereby, poverty largely drives individuals to ADM (Buxton 2013, 4, Partnership Africa Canada and Global Witness Publishing Inc. 2004), ADM degrades the environment and reduces the land available for farming, (Gberie et al 2004) which reduces economic opportunities in already communities with high poverty, low education, and high jobless rates. Long-term poverty and lack of economic opportunity (UNEP 2010) (exacerbated by low government trust, corrupt leadership, regional instability and illegal trading) prolong the countries fragile state, increasing risk for instability and conflict. In Sierra Leone, poverty and desperation in the context of corrupt leadership led to a struggle for power and violent conflict; and artisanally mined diamonds – small, valuable, hard to trace – became the illicit currency of this struggle. This cycle is not simple, direct or inevitable, but the conditions create a risky positive feedback loop. While the complexity of this reality is far beyond the scope of this report, here I want to draw greater interconnectivity between the four elements this *ADM-Degradation Cycle*: poverty, artisanal diamond mining, environmental degradation, and conflict. This draws a more tightly bound connection between the lives and efforts of those working in artisanal mines and the broader reaching risks to their communities, government, the diamond industry and region; risk that industry, policy makers and NGOs must seek to mitigate.

These issues – conflict diamonds, illicit diamonds, smuggling, artisanal diamond mining – have been the subject of many reports and initiatives from governments, development organizations, civil society, and academia (Le Billion, Wilson, and Levin). The contribution to this discussion that I seek to make with this Master's Project stems from its impetus. While this Master's Project is not client-driven, it was inspired by Clarity Project, a small diamond jewelry company that I co-founded in 2009, to use diamond jewelry to improve the lives of diamond miners and their communities. The Clarity Project sought a fairly sourced supply of diamonds that consumers would feel confident in and that made a positive contribution to the community. Any ground level effort in Sierra Leone would arise only through a thorough understanding of the dynamics and desires of community members, and only if there was an appropriate activity that a company like Clarity Project

[1] Causation or correlation are beyond the scope of this report.

could effectively take on. The Clarity Project perspective and constraints influenced research design principles in the following ways:

1. Work within a small company budget, influence and scale: Solutions could not be a large-scale, large-budget approach, thus large-scale mining or policy recommendations would not be within the scope of this effort. Accordingly, diamond miners, their families, and operations at artisanal mines are the focus of my research and recommendations.

2. Connect impact goals with business goals: This is not a policy or civic society level approach. The business is that of selling diamond jewelry. This constraint translated into seeking solutions that could create a positive impact through diamond mining. With improved operations as the starting point of the value chain, Clarity Project could deliver on the consumers' interest for positive impact, traceability and stories from producers. Thus has a significant impact in that policy and politics provide an important backdrop, but they are largely absent from my research, findings, or takeaways.

3. Seek near-term solutions from the community: In seeking a business solution to the challenge of finding a diamond supply chain that consumers can trust and has a positive impact, the first step was to talk with the community (stakeholder engagement). Miners are acutely aware of the challenges in diamond mining and trade. Thus, direct conversation provides insight into challenges and goals of the community and industry, and enables collaborative problem solving.

The goal for my Master's Project is to better understand current environmental awareness, practices, and attitudes of community members, miners, and government officials in the diamond-mining region of Sierra Leone, around Koidu Town, Kono District, to explore interest and current capacity for small changes at the individual, community or artisanal mine level to improve the social, economic, and environmental wellbeing of diamond miners and their communities. Section 1 provides an overview of primary research that I conducted in the summer of 2012, Section 2 sets context with description of ADM, background of Sierra Leone, environmental impacts of mining, and more. Section 3 concludes with findings and takeaways.

SECTION 1:
RESEARCH OVERVIEW

I selected Sierra Leone for this research as it actively seeks to make diamond mining a lucrative part of its post-conflict development agenda; and despite the enormity of unknowns in ASM, there is quite a bit of literature about ADM in Sierra Leone. More, my relationships in this country enabled me to gain access to diamond miners and insight into the issue of ADM in Sierra Leone.

OBJECTIVE

To understand current environmental awareness, practices, and attitudes of affected populations in order to identify ideas, interest and current capacity for small changes at the individual, community or artisanal mine level to improve the social, economic, and environmental wellbeing of diamond miners and their communities.

HYPOTHESIS

Diamond miners and mining communities feel overwhelmingly negative impacts of ADM; yet lack resources to pursue solutions. By making small changes at the individual, mine, and community level toward more socially and environmentally sound practices, ADM can be a critical lever for positive change in Sierra Leone.

METHODOLOGY

In advance of and following my field research, I conducted a robust literature review to understand the legal and social landscape, as well as what I came to see as the complex systemic connection among poverty, artisanal diamond mining, environmental degradation, and conflict. Section 2 includes analysis from this review, as well as information that I learned in Sierra Leone, beyond the interviews, and in subsequent visits to the region, that have enhanced my understanding of ADM. I conducted the following field research in the summer of 2012:

1. Thirty interviews with miners[2], Paramount Chiefs, Town Chiefs, community members, Mines managers[3], diggers, artisanal mining license holders[4], and Farmers, to understand current environmental awareness, practices, and experience with operations and externalities of diamond mining.
2. Conversation with environmental, policy, extractives, geological and finance experts, as well as international development agency representatives, to explore the systemic influence and externalities of diamond mining.

LOCATION

I conducted these interviews in the Kono District, primarily around the largest diamond-mining town in the District, Koidu Town. Kono District is where diamonds were first discovered in Sierra Leone, and it is the primary diamond-mining region in the country. It has been and continues to be the least developed part of the country (Smillie 2014, 143). I held conversation with experts in their offices in the capitol city, Freetown.

INTERVIEWEES

In order to gain a more comprehensive perspective, I chose interviewees to span the following categories:

- Role and influence variation: Individuals who are directly involved as workers, license holders, mines managers, chiefs who are making land use decisions, and community members who live in mining regions and may or may not have family members involved in diamond mining.
- Age and perspective variation: From younger workers to people who have experienced generations of land change, multiple mining seasons, and variation in government and policy.
- Environmental variation: People who are experiencing land at different stages of use. Including land that has been mined and re-mined for decades, agricultural land

[2] The term "Miners" is a general term, which includes managers. "Diggers" refers to the workers who are in the pits. For the sake of simplicity in this report, the term "Miners" is used as an umbrella term, unless specified.
[3] Mine Managers are Sierra Leoneans contracted by the financier, or Supporter, to manage the mining operations and to hold and transport rough diamonds on the Supporter's behalf. It is illegal to carry or transport a Supporter's rough diamonds without this license.
[4] License holders are citizens of Sierra Leone who hold the mineral rights to the land and have the legal ability to mine a demarcated area, approximately 1 acre.

being cut down to mine, forested areas being cut down to mine, locations in which people were refilling abandoned mine land, and areas with pending relocation[5].

LIMITATIONS OF IN-PERSON INTERVIEWS

I was limited by those I could connect with, given the private nature of diamond mining: Duke University's Internal Review Board (IRB) protocol required that I not record what could be illegal practices and the lack of clarity on whether operations were illegal or legal required me to avoid information that could be incriminating; due to the high value of the diamonds, diamondiferous land is highly coveted; locations and true practices are not openly shared; and I was limited somewhat by the network of my translators, their knowledge of mining sites, and their own perspectives on most interesting sites. There is significant activity in and widespread knowledge of informal extraction and trade. I did not ask to see licenses to verify the accuracy of legality claims (per Duke University's IRB protocol), instead I did not record names of those whom I interviewed.

I was unable to test soil or water given lack of timing and sheer breadth of the challenge: Soil and water samples would be critical, but proved a project far too large for my time and resources. I chose not to collect any samples rather than collect incomplete or inconsistent samples that might skew information or perspectives.

The rainy season created access and observation challenges: Heavy rain made some mining sites inaccessible, or led to increased erosion of once defined mine sites preventing direct observation of mining operations.

The need for translator: Given the variety of tribal languages spoken in Kono District, I worked with a very competent and knowledgeable translator.

The inherent gap in what people say and what people do: This reality is present in all qualitative interviews. Direct observation and questioning then becomes more critical to understanding the behaviors and activities employed, however this also leaves room for great subjectivity in analysis.

[5] Individuals are mining land directly around their homes before they are resettled to new houses. Their current houses are on mining concessions for the nearby large-scale, kimberlite mine (formerly Koidu Holdings, now Octea). Families will be moved from their homes and transferred to company-funded houses as part of the mine's expansion plan.

SECTION 2:
BACKGROUND

ARTISANAL/SMALL-SCALE MINING (ASM) & ARTISANAL DIAMOND MINING (ADM)

Artisanal and small-scale mining (ASM), globally, is defined in broad terms as it varies globally in resource/mineral, scale, seasonality, licensing, and accessibility. The ASM distinction includes diamonds, but is not limited to diamonds. In fact, "Artisanal and small-scale mining contributes 15-20 percent of global minerals and metals… producing approximately 80 percent of all sapphires, 20 percent of all gold and up to 20 percent of diamonds" (Buxton 2013, 3). In this report, I use the term ASM as well as Artisanal Diamond Mining (ADM) as the variety of literature and articles that I have reviewed vary in scope, and ASM is an umbrella term that includes ADM.

ASM globally dwarfs the numbers of those who work in large-scale mining by a factor of 10 (Buxton 2013, 3), environmentally significant given the impact on soil, biodiversity, forests, etc. "ASM as an economic activity compares both favorably and unfavorably with its counterparts in forestry, fisheries and farming — but it is much less well understood" (5).

GEOLOGY OF SECONDARY DEPOSITS OF DIAMONDS

Diamonds form between 150 to 200 km beneath the earth's surface in the lithosphere (the upper crust of the mantle), though there are indicators of 'ultra-deep' diamonds forming at depths of 700 km or greater. There is dissension around the actual formation of diamonds as some research suggests that diamonds crystallized over one billion years ago in the mantle, and were surfaced by younger events (Stornaway Diamond Company 2014). As a result, diamond deposits can be classified as 1) primary (kimberlites and lamproites) pipes, dikes, and sills, and 2) secondary (alluvial, marine, surface, and placer) that result from primary deposits erosion into waterways. Artisanal mining, the focus of this paper refers to the recovery of these secondary deposits.

Figure 1: Diamond Formation

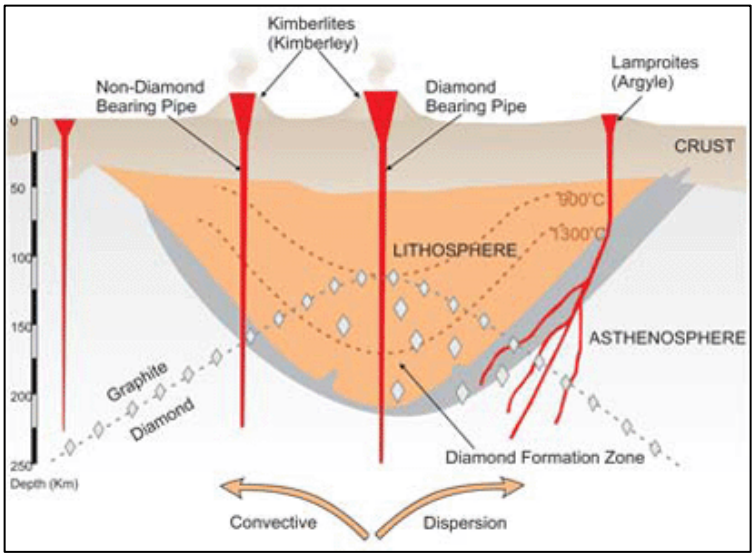

Illustration of Kimberlite, Lamproite, how diamonds move from earth's mantle to crust. Not all Kimberlite pipes are diamondiferous. (Over A Billion 2014).

Primary kimberlite deposits require heavy machinery and explosives for extraction and processing to separate the semi-embedded diamond from the kimberlite. Artisanal mining takes place on the earth's crust and is easily processed with water, or underwater in rivers and coasts in which underwater dredging is required to recover diamonds.

This report focuses on the rough diamonds extracted from the land; it does not include the remainder of the value chain, through which diamonds are classified, sorted, sold and processed into gem or industrial diamonds.

SIERRA LEONE: HISTORY & DIAMOND MINING

SIERRA LEONE

In 1787, abolitionists "repatriated" former slaves from Britain, Jamaica, and Nova Scotia, among other countries, to establish a settlement in Freetown, Sierra Leone. Contemporary society includes 16 ethnic groups (Visitsierraleone.org 2014b), including Krio, Kono, Limba, Fula, Madingo, Shabu, the main languages are Krio and English, and most people practice Islam or Christianity. From 1808 until gaining independence in 1961, Sierra Leone remained under British rule (BBC News 2011).

Table 1: Sierra Leone at a Glance (2013 estimates unless marked otherwise)

Population (2014 est.) (CIA 2014)	5,743,725
GDP (purchasing power parity):	$9.156 billion
GDP - per capita (PPP):	$1,400
Population below poverty line:	70.2% (2004)
Agriculture - products:	rice, fish, coffee, pigs, palm kernels, peanuts, poultry, cattle, sheep, cocoa, palm oil
Industries:	diamond mining; iron ore, rutile and bauxite mining; small-scale manufacturing
Exports:	$1.563 billion
Export Commodities:	diamonds, rice, cocoa, coffee, fish

Sierra Leone is on the coast of West Africa, bordered to the north and east by Guinea, the south by Liberia, and the west by the Atlantic Ocean, (Appendix 1). Geographically, its 71,740 square kilometers sits at 8 30 North and 11 30 W (Greenwich Meantime 2014), with a tropical, hot, and humid climate. The rainy season runs from May to December, and the dry season from December to April. With rainfall up to 195 inches per year, it is considered one of the wettest places in Western Africa, (CIA 2014). Freetown, Sierra Leone's national capital and largest city, sits on the Western Peninsula at the world's third largest natural harbor (VisitSierraLeone.org. 2014a).

PRE-WAR & POST-COLONIAL DIAMOND MINING IN SIERRA LEONE

Discovered in the early 1930s, diamonds form Sierra Leone boast consitently high quality with the average price per carat among the highest in the world. (Partnership Africa Canada and Global Witness Publishing Inc. 2004). Unfortunately, the trade of these high quality diamonds has been marked by failure.

Table 2: Summary of Key Milestones in the Diamond History of Sierra Leone (Frost 2012, Smillie 2010, 2014)

1930	Diamonds discovered in Sierra Leone
1935	Diamond trade established, British colonial authorities grants DeBeers 99 year monopoly on Diamonds in Sierra Leone through the Sierra Leone Selection Trust (SLST)
1937	Diamond production exceeds one million carats
	Production soars in Kono and Kenema Chiefdoms, regions become economic hubs, attracting tens and thousands of illicit miners, former farmers from Sierra Leone, Liberia and Guinea Illicit miners drive smuggling on a vast scale. Build up of security in Freetown leads smugglers to reroute diamond trade through Monrovia, Liberia Effectively brings an end to the monopoly of SLST
1955	British colonial authorities officially dissolve SLST's monopoly
1956	British colonial authorities establish the Alluvial Mining Scheme whereby indigenous and local miners can retain mining and trading rights The "Great Diamond Rush[1]" of Sierra Leone, in which the number of illicit diamond miners tops 75,000 individuals
1961	Sierra Leone gains independence from British colonial control Sierra Leone People's Party (SLPP) closely connected to British leadership, wins national elections
1967	All People's Congress (APC) wins national elections from SLPP
1968	APC leader, Siaka Stevens, becomes new Prime Minister. Official succession was prevented the year prior by a military coup, and then reinstated by a counter coup
1970	Legal exports of diamonds peak at two million carats a year

1971	Stevens becomes Sierra Leone president, forms National Diamond Mining Company, obtains 51% stake in SLST, politicizes diamond production
1978	Sierra Leone effectively becomes a one-party state as Stevens establishes political dominance for APC
1980s	Stevens backs a shadow patron-client based system of diamond trade outside of formal institutions Legal exports decline to 595,000 carats per year since peak in 1970 Violence starts to erupt in diamond mining regions
1985	Stevens retires, APC appoints Major-General Joseph Saidu Momoh; Momoh claims he will rid the country of the diamond fuelled shadow state Government Gold and Diamond Office established to formalize diamond trade, but Momoh's own shadow patronage networks render legal diamond institutions ineffective and inconsequential
1988	Legitimate exports plummet to 48,000 carats per year
1991	RUF enters Sierra Leone through Liberia (More below in "Diamond Fueled War"
1992	Military coup led by Army Captain, Valentine Strasser Strasser and troops take mining fields in Kono, exchange diamonds for weapons in Belgium and Romania

DIAMOND FUELED WAR IN SIERRA LEONE

After political turmoil and corruption through the 1970s and 1980s led to a declining economy and mining sector (see Table 2), the country was vulnerable. A Strasser led military coup in April 1992, promised to end corruption, but within a year, this new leadership sought diamonds for their own beneficiation. During this time, former Army Corporal Sankoh, who had been jailed after a failed coup attempt years before, grew in his resentment and pursued plans for another coup attempt. To ensure success on his next attempt, Sankoh trained in "Revolutionary behavior" and "ideological training" (Smillie 2014, 50) techniques with Libyan leader Muammar Gaddafi, alongside corrupt, revolutionary Liberian leader, Charles Taylor. Sankoh recruited a troop of rebels, the Revolutionary United Front (RUF), who crossed the border into Sierra Leone from Liberia to seize diamonds that could be exchanged to purchase weapons. Diamonds - small, light, hard to trace, valuable, mined with simple tools – proved the perfect currency to fund what

Sankoh promised to be a "people's struggle" (49). Sankoh's rebel RUF stormed through diamondiferous countryside plundering villages, raping and killing civilians, chopping the hands and feet off of those laborers who refused to listen to the RUF. Young boys were drugged and brainwashed and socialized into murderers, while young girls were taken as sex slaves. More than 2 million people were internally displaced and death toll estimates were a (likely low) 75,000 (52). The country's infrastructure - health facilities, schools, businesses, housing roads - and natural environment was utterly destroyed (BBC News 2011). Sierra Leone "ceased to exist as a functioning country" (Smillie 2014, 52).

For many Sierra Leoneans, uncertainty remains over the reason for the war, because it seemed unfounded, aimless. Ian Smillie, one of the founders of the Kimberley Process Certification Scheme, boils it down to power:

> "The RUF had no ethnic basis; their fight was not about land and it had no focused ideology… It was about power, pure and simple. It was a conflict made possible – the RUF would have said *necessary* – by the corruption and incompetence of a diamond-addled government. The irony, of course, is that the RUF would use the same things that created the governmental venality it hated – diamonds – to wreak a staggering level of additional brutality on an already ruined country" (52).

Between 1995 and 2000, diamonds estimated at a worth of $25 - $125 million dollars per year worth were plundered and smuggled out of Sierra Leone (51), and exported through Liberia or Cote D'Ivoire into the global market. The 11-year war was marked by economic, political and military turmoil including: four national government coups; Nigerian and ECOMOG military attempted support and retreat after unrelenting violence; Armed Forces Revolutionary Council (AFRC) battled with civil defense forces (Frost 2012, 76); UN and US diplomacy attempted peace agreements which rewarded Sankoh; South African security forces *Executive Outcomes* killed off RUF leaders in return for mineral rights to the kimberlite pipes, rights to which are honored still (Smillie 2010, 112). From 1999 – 2001 Sierra Leone diamond exports dropped in half (Frost 2012, 77). In Liberia, with diamond deposits considered negligible, exports rose to $300 million (76).

Table 3: Breakdown of 1999 Exports (Frost 2012, 76)

Official Exports	$1.2 million
Total Export Estimates	$138 million
Amount to RUF	$70 million
Amount to Civil Defence Forces (CDF)	$10 million
Outside control of RUF and CDF	$50 million

In 2001, British troops secured Freetown, Sankoh was arrested, and the embargo on Liberian diamonds curbed the illicit exchange of diamonds traded for weapons, or "conflict diamonds." The war came to an official end in January 2002 (Smillie 2010, 113).

KIMBERLEY PROCESS CERTIFICATION SCHEME (KPCS) & BEYOND

In 2000, the United Nations (UN) General Assembly adopted a resolution to create a country of origin certification scheme to regulate, track, and trace the supply chain of rough diamonds fueling civil war worldwide (KPCS 2014a) (Angola, Democratic Republic of Congo, Ivory Coast, Liberia, the Republic of Congo, and Sierra Leone). In 2003, civil society organizations (KPCS 2014a) from diamond mining nations and the international diamond industry, through the World Diamond Council (WDC) (Bieri 2010) developed the Kimberley Process Certification Scheme[6]. The KPCS regulates what the UN defines as conflict diamonds:

> "Diamonds that originate from areas controlled by forces or factions opposed to legitimate and internationally recognized governments, and are used to fund military action in opposition to those governments, or in contravention of the decisions of the Security Council" (Diamondfacts.org 2011a).

The KPCS unites the commitment of participant nations around three primary requirements: achieve minimum standards for legislation and regulatory institutions, adhere to controls on the import, export and internal trade of diamonds, and commit to a basic level of transparency and reporting on trade statistics (KPCS 2014a). To meet these commitments, member nations can only legally trade in rough diamonds with other members. Parcels of rough diamonds pass through a centralized office in each export nation to receive a Kimberley Process Certification. To institutionalize this certification in the United States, the US Government under President George W. Bush issued the Clean Diamond Trade Act (Clean Diamond Trade Act. Pub. L. 108-19, 19 U.S.C. 3901. 2003), making illegal the import or trade in any diamond that fails to carry a KPCS certification.[7] To

[6] On December 5, 2011, Global Witness, the international human rights organization that helped to craft the KPCS, withdrew its support of the KPCS citing claims that "[the KPCS] has become an accomplice to diamond laundering – whereby dirty diamonds are mixed in with clean gems" (Global Witness 2011).

[7] Text from the law: "(a) PROHIBITION.—The President shall prohibit the importation into, or exportation from, the United States of any rough diamond, from whatever source, that has not been controlled through the Kimberley Process Certification Scheme." Accessed December 2, 2014 at the following online source: http://www.treasury.gov/resource-center/sanctions/Documents/pl108_19.pdf

date there are 74 (DiamondFacts.org 2014) KPCS member countries and less than 1% of the world's diamonds are considered conflict diamonds (DiamondFacts.org 2014).

Neither national Sierra Leone policy nor the KPCS directly contributed to the end of the war in Sierra Leone. However, the industry managed transparency mechanism of KPCS is intended to help prevent such atrocities from taking place again. GoSL has developed and adapted policy to further regulate and formalize the diamond industry.

Many in the industry saw that while the KPCS would be central to an effective system to stem the flow of conflict diamonds, it would not address the underlying causes that created this vulnerability to conflict[8]. Within Sierra Leone, there have been multiple policy-based programs to address poverty and insecurity in ADM communities. See Appendix 7 for a review of past diamond-based development and environmental initiatives, including their intended goals, stakeholders and outcomes.

Beyond the KPCS, efforts to incentivize and standardize improved diamond mining practices have been pursued by multiple organizations, most notably the Diamond Development Initiative, which is in the process of creating a certified "development diamond" based on progressive standards for social and environmental performance. More, a small selection of industry led pursuits include: The Tiffany and Co Foundation has explored feasibility of fair trade diamonds (Miller 2008); Martin Rapaport pursued ASM projects in Sierra Leone and has been vocal about the development of fair trade diamonds across the value chain (Rapaport: Fair Trade 2014); and JewelTree Foundation is creating a track and trace certification so community miner can access a global market (Angenent 2014). From the international community: The US State Department's and USAID's joint Property Rights of Artisanal Diamond Development program (PRADD) and PRADD 2 to support the KPCS through formalization of ASM land rights and mining operations (USAID Land Tenure, 2012); and the World Bank established the Consultative Group for Artisanal and Small-Scale Mining (CASM) to create integrated solutions to those social, economic and environmental challenges in ASM communities (World Bank 2014). In efforts to avoid the chance of conflict diamonds all together, some diamond jewelers have sourced from more developed countries and non-African, large-scale mines in Canada, Australia, and Russia.

[8] More on this on page 29 "The ADM Degradation Cycle & the Potential for Change."

DIAMOND MINING GOVERNANCE IN SIERRA LEONE

In 1994, Sierra Leone passed the Mines and Minerals Act to formalize a more decentralized diamond sector. This Act was amended in 1999 with additional regulations around lawful possession and licensing, but did not include reference to environmental management (GoSL 1999). The tumultuous political environment at that time made implementation of such laws unrealistic. However, the issues associated with ADM were widely recognized. In his speech in August, 2003, President Tejan Kabbah acknowledged the great need for change, stating that, "'common and well-known problems associated with the diamond industry in Sierra Leone' as follows: illegal mining, smuggling, environmental damage, poor working conditions, including child labor and misuse of official positions and power" (Gberie 2004, 1).

The Mineral and Mines Act was updated in 2004 and again in 2009 to include greater specificity around environmental regulations and requirements for mining license holders. There was an explicit goal of helping diamonds become,

> "Good for the people…a source of economic recovery/peacebuilding given the legacy of the role of the diamonds in the conflict… It directly addresses health and safety, environmental protection, and community development and makes performance in all of these areas a condition for obtaining and keeping a mineral rights license" (MMR 2009a).

This Act governs the Mines Division that manages mineral licensing within five designations: Reconnaissance License, Exploration License, Artisanal Mining License, Small-Scale Mining License, and Large-Scale Mining License (Appendix 6).

In 2013, the National Minerals Agency (NMA) was established as the government's implementing body of the policymaking Ministry of Mines and Mineral Resources. The NMA was enacted in order to divide the policy making body from the implementing organization as the government seeks to mature its resource management capacity. Changes in laws that affect the artisanal diamond-mining sector include[9]:

- Increase in the cost to attain the artisanal diamond mining license

[9] Despite multiple attempts to access this information online, the links to these laws on the Ministry of Mines and Mineral Resources website are broken so I have not been able to access these online. This information was communicated to me directly during subsequent trips to Sierra Leone in October and December 2013.

- Increase in compensation norms, e.g., doubled cost of incentives[10] for mining license holder
- Requirement for Environmental Impact Assessments for artisanal mining licenses if heavy machinery is going to be used for extraction.

In 2008, the government of Sierra Leone, led by H.E. Dr. Ernest Bai Koroma, proposed a comprehensive, four-year *Agenda For Change* (The Republic of Sierra Leone 2008). This Agenda sought to transform the country by developing the private sector and attracting foreign direct investment. Boasting the richness of arable land, high rain levels, fishery stocks, and mineral assets, while on the verge of major iron ore exports and hydroelectric activity, the GoSL's economic development plan profoundly relied on natural ecosystems.

The *Agenda for Prosperity* in 2013 followed the *Agenda for Change* and maps the strategy development plan from 2013 – 2018; there are eight pillars of development, of which "Managing Natural Resources" is number two (GoSL 2013).

A recently updated website (two years following my 2012 research) shares the promising, developing protocols for artisanal mining planning and environmental management, namely the "Environmental Management Plan in Respect to Artisanal Mining Licence," a form to be submitted along with the artisanal license application to the Ministry of Mines and Mineral Resources (MMR 2014).

ADM, TRADE & OPERATIONS IN SIERRA LEONE NOW

Sierra Leone's mineral sector has contributed substantially to the economic growth since the end of the hostilities (UNEP 2010, 23). After years of unsuccessful attempts to formalize diamond mining during the war, large mining companies have since reentered the sector (See Appendix 9 for information on Sierra Leone's legal diamond production from 1992 to 2013). As of 2006, government estimates, based on numbers from the World Bank, assert that there are up to 40,000 diamond miners in Sierra Leone, with 200,000 – 400,000 individuals indirectly engaged in the sector, e.g., dependents; roughly 4 – 8 % of the total population of the country (MMR 2010). While other estimates suggest that there

[10] Incentive: Funding in money and rice, that the supporter pays license holder monthly in return to mineral rights, ability to mine land in the way the supporter desires, and relationship management with Paramount Chief.

may be as many as 120,000 artisanal miners in Sierra Leone (DDI 2011). In 2013, ASM accounted for a volume of 125,637.02 carats valued at $43,481,327.28, with prices per carat at $346.09 this accounted for 37.9% of total export (N.M.A. 2013).

Figure 2 (following page) provides a very simplified representation of artisanal diamond processing. For a more normative version, please refer to Appendix 5 as it more closely sets context for ADM realities. The geological characteristics of ADM create unique social challenges (MMSD 2002) in that the low barrier to entry and distributed deposits make ADM accessible even with little money so regulation is incredibly difficult. ADM in Sierra Leone is largely characterized by (Partnership Africa Canada Global Witness Publishing Inc. 2004, DDI 2014):

- Limited, if any, standards for health, sanitation, and safety
- Significant environmental impact and limited environmental management
- Un-mechanized and labor-intensive operations
- Primarily male adults and male youth
- Widespread informal or illegal mining
- Miners that have poor access to support services and market information
- Seasonal mining[11] based on the rains
- Inconsistent income

[11] In Sierra Leone, ASM takes place during the dry season running from approximately mid-November – mid June. Many miners and laborers are also farmers.

Figure 2: Overview of Artisanal Diamond Processing

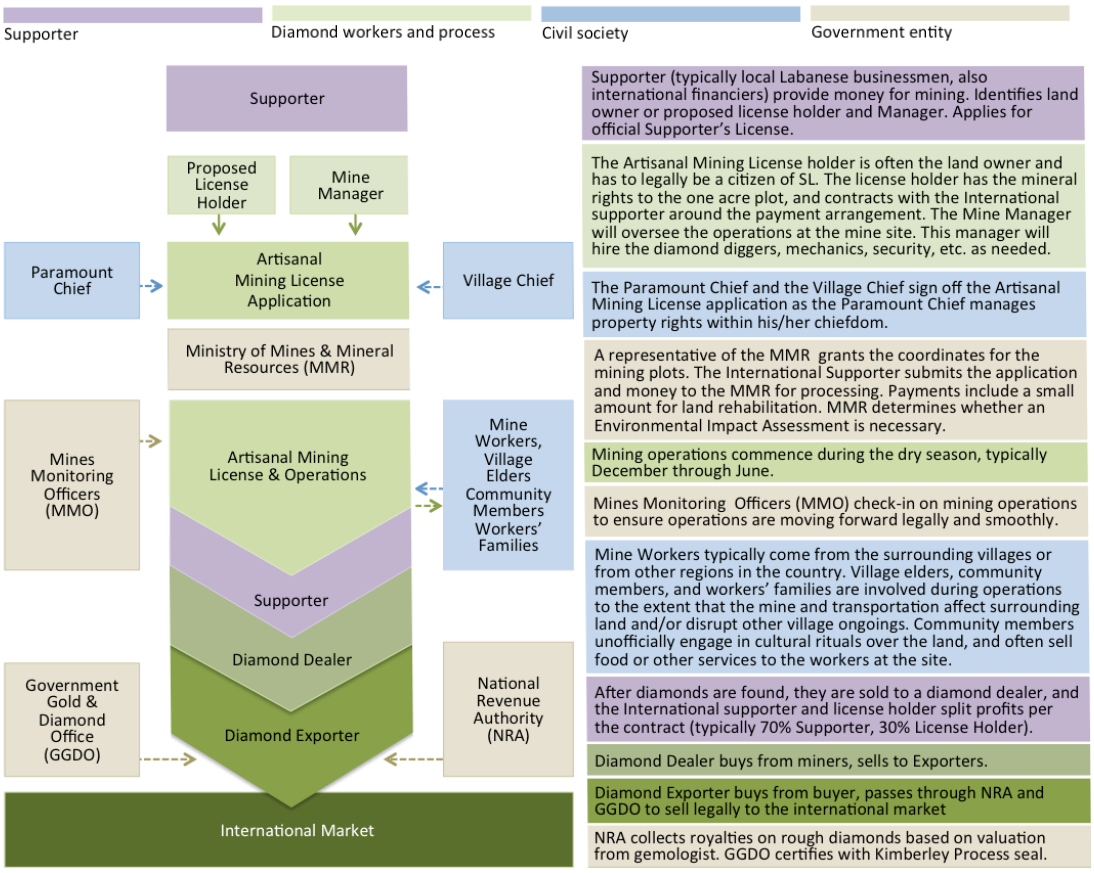

Figure 3: Simple Profile of Soil Horizons in Sierra Leone

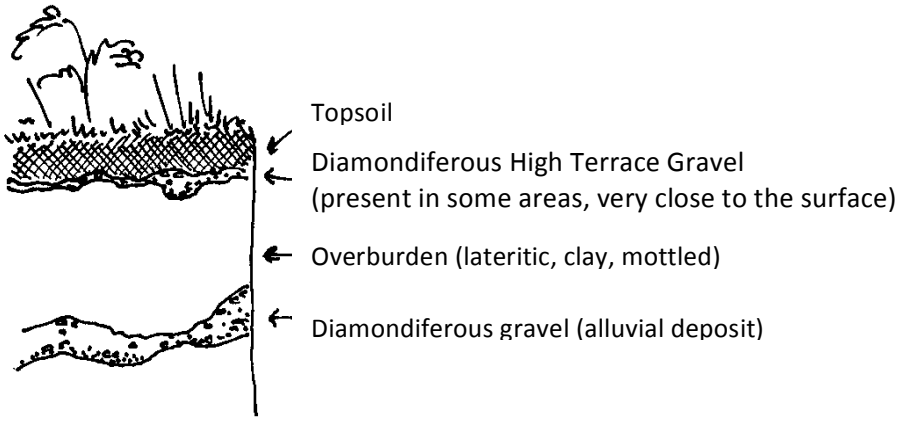

Image 1: Transferring Gravel to Jig for "Shaking" to Create Diamondiferous Concentrate

Image 2: Individual Diamond Diggers Working in a Pit

Image 3: Diamond Diggers "Washing" Gravel with Shakers[12]

Image 4: Closer View of Washing Gravel in the Shaker

[12] A shaker is a locally made sieve with a screen nailed to a round wooden frame.

NEGATIVE ENVIRONMENTAL EXTERNALITIES OF ADM

The Diamond Industry Annual Review of Sierra Leone 2004, called artisanal mining "An Environmentalist's Nightmare" (Gberie 2004). Critical to this point is the profound lack of data about minerals in Sierra Leone thus making environmental impact even more difficult to quantify (See Appendix 4 for a more detailed note on lack of data and destroyed records). Negative environmental externalities are due to diamond mining in Sierra Leone are significant and include:

- Land Disturbance: Damage and destruction to forest environments lead to habitat loss, biodiversity loss, erosion, topsoil loss, and water pollution (Diamondfacts.org 2011b). Such negative externalities dilute the nutrient rich soil upon which farmers depend, and abandoned pits leave land unproductive for economic activities.
- Polluted Waterways: Sedimentation, siltation and exhausted fuels from mines lead to disease, unusable water (for cleaning, drinking, etc.), they threaten biodiversity, and weaken river-dependent industries like fisheries.
- Disease: After artisanal and small-scale miners leave a site, abandoned pits remain open to gather water and breed disease. According to the CIA world fact book, risk of contracting waterborne infectious disease (bacterial and protozoal diarrhea, hepatitis A, and typhoid fever), water contact disease (schistosomiasis) and aerosolized dust or soil contact disease (Lassa Fever) is very high (CIA 2014).
- Degraded Mangroves: The coastal belt of mangroves is threatened by down-river sedimentation and pollution. Mangroves, known for rich biodiversity, support the salt, timber and fishing industries; protect coastline from erosion and natural disasters, and sequester carbon (Thomas 2010).

As mentioned, in 2014, the requirement for Environmental Impact Assessments (EIAs) was extended to ADM licensed sites where heavy machinery will be in use. As the majority of easily accessible surface deposits have been mined and re-mined since the 1930s, miners will need to dig deeper into the ground to find diamonds. The use of heavy machinery will increase in order to exploit these untouched deposits.

Image 5: Diamond Miners Using Heavy Machines and Jig, Bafin River

Image 6: Contiguous Artisanal Mine Sites (Heavy Machinery was Used)

Image 7: Historic Abandoned Mine Land (Formerly Jungle)

Images 8 & 9: Mining Pits with Water (Pumped-out during mining season)

THE ADM-DEGRADATION CYCLE & THE POTENTIAL FOR CHANGE

In Sierra Leone, more than a decade after the conflict, almost 51.7% of the population lives on less than PPP US$1.25 per day (UNDP 2014). The adult literacy rate of those aged 15 years or more was just over 43%, with the average amount of schooling less than 3 years (UNDP 2014). Infrastructure throughout the country, from schools to homes to roads, remains in ruins. The United Nations Development Programme (UNDP) Human Development Index ranked Sierra Leone 183 out of 187 countries (UNDP 2014). Poverty largely drives individuals to ADM (Buxton 2013, 4, Partnership Africa Canada and Global Witness Publishing Inc. 2004, Appendix 2), ADM degrades the environment and reduces the land available for farming (Gberie et al 2004), which reduces economic opportunities in already communities with high poverty, low education, and high jobless rates. According to the World Bank, "Poverty increases the likelihood of civil war... [and] the key root cause of conflict is the failure of economic development" (Partnership Africa Canada and Global Witness Publishing, Inc. 2004). In Sierra Leone, poverty and desperation in the context of corrupt leadership led to a struggle for power and violent conflict; and artisanally mined diamonds – small, valuable, hard to trace – became the illicit currency of this struggle. While the reasons are far more complex than the scope of this report, in Sierra Leone there is an *ADM-Degradation Cycle,* a connection between the four elements: poverty, artisanal diamond mining, environmental degradation, and conflict. This cycle is neither simple, direct nor inevitable, but the conditions create a risky positive feedback loop. The need for economic development in Sierra Leone is apparent and urgent.

In early 2010, the United Nations Environment Programme (UNEP) released a post-conflict environmental assessment, entitled "Sierra Leone: Environment, Conflict, and Peacebuilding Assessment," [13] to identify specific environmental impacts from the conflict and environmental threats to peacebuilding[14] initiatives in Sierra Leone (See Appendix 3

[13] Sierra Leone is one of six countries on the agenda of the United Nations Peacebuilding Commission, an intergovernmental advisory group helping countries emerging from conflict to build peace (UNPB 2014).
[14] Peacebuilding refers to "structures to promote sustainable peace by addressing the 'root causes' of violent conflict and supporting indigenous capacities for peace management and conflict resolution" (PBSO 2014).

For overview of UNEP's approach to environment and peacebuilding dynamics). This assessment revealed that the country continues to reel from critical environmental impacts of civil war and barriers to environmental success that are not yet within government control, namely [15](UNEP 2010):

1. Direct impacts from the war remain: While war officially ended more than a decade ago, direct destruction and environmental impacts remain. Lack of support to rebuild the destroyed water infrastructure and agriculture land in rural communities reinforces concerns that the central government is neglectful of rural communities and, consequently, neither monitoring nor regulating natural resource use.
2. Weak environmental governance: Governance of natural environments and resources is virtually non-existent, and thus there are few mechanisms of control over land use, destruction, and cleanup. Such a lack of institutional capacity, coupled with ill-coordinated goals and mandates, further complicates efforts to organize and implement action plans. Much of the country's natural resource management capacity is held by NGOs (12).
3. Institutionalized and unsustainable coping strategies: The war resulted in huge refugee populations seeking modes of basic survival. Coping strategies and livelihoods that enabled their escape were primarily unsustainable forest, agriculture, and mining practices. Though critical at the time, such strategies have become institutionalized in the decade since the war to detriment of natural ecosystems.

Though the UNEP report recognizes some gains in resource and environmental regulation, it clearly asserts that, "Sierra Leone remains in a fragile state, with many conditions in the environment and natural resources sector that resemble, or are worse than, the circumstances that led up to the fighting" (3). Citing social struggles, poverty, regional instability and increase in illegal trading, UNEP warns that, "the natural resource-linked risks for instability or conflict are significant" (3). More specifically, the report outlines following ways in which negative environmental impacts undermine peace efforts:

[15] Some of the exists mentioned here are beyond the realm of ADM, but are relevant given impacts on the ecosystem and waterways.

1. Considerable unmet expectations from natural resources: Lack of information and expertise has created a misperception of expected benefits from agriculture and natural resource cultivation that perpetuates unease. UNEP cites climate change and population pressures on agriculture as threats that will exacerbate this problem (3).
2. Low transparency and accountability: Lack of government accountability and transparency fuels perceptions of exploitation and corruption, and creates opportunities for illicit activities (3).
3. Poor benefits sharing: Inequitable profit sharing and unequal income distribution enhances division of influence and power at great risk to long-term peace (3).
4. Increased local violence: Frustrated with government insufficiency and ongoing inequality, some mining communities feel as though the only way to communicate their upset is through protests and threats of violence (3).

More, the unclear, changing and conflicting mandates, in addition to the lack of data, capacity, and expertise to implement environmental protections undermine and complicate sincere attempts at policy follow-through (3).

There is enormous potential for ADM to contribute to development in Sierra Leone. In 2004, Global Witness and Partnership Africa Canada conducted a study of three countries to encourage a paradigm shift to convert the conversation around the prevention of conflict diamonds into recognizing the unique contribution that diamonds can make to development. Their findings suggest the power of the artisanal mining sector in those countries, including Sierra Leone, to be a net benefit for the country. The study (Partnership Africa Canada and Global Witness Publishing Inc. 2004, 31) concludes that: 1) ASM will never generate significant revenues for governments, 2) most artisanal diamond diggers are taking a gamble and earning an "average of only a dollar a day"(31), 3) compensation could increase for artisanal diamond diggers, and 4) that diamonds can be a foundation of sound financial stability.

SECTION 3:
FINDINGS

Rooted in the historical context of diamond mining (presented in Section 2) my field research sought to better understand current environmental awareness, practices, and attitudes of affected populations to explore ideas, interest and capacity for more socially and environmentally sound ADM practices to reduce environmental degradation and poverty in Sierra Leone. My research revealed seven findings:

Finding 1: Lack of Accountability

There are promising laws in place, but gaps in responsibility, motivation and control means that environmental regulations fall through the cracks. The government has the responsibility. It collects rehabilitation fees as part at the licensing process. However, there is currently no effective initiative to see land rehabilitation through. One diamond miner stated:

> *"Maybe I will cast my blame on the Ministry of Mines and Mineral Resources. We do pay specific fees for land rehabilitation but we are not seeing it being done."* - Miner

Locals have the motivation. Local workers and community members who are affected by long-term negative impacts are motivated to follow-through on environmental standards but lack resources to do so.

Supporters, the individual who provides the funding for operations and workers' wages, have control. Supporters, commonly local business men and diamond dealers as well as international individuals or companies with short term, seasonal interests, have little reason to spend extra money on anything that does not enhance the profitability of their sites. While environmental regulation can be mandated for larger, international companies with more visibility and international regulation, the widespread and informal,

relatively low profit nature of ADM means that environmental accountability falls through the cracks. This sentiments was expressed primarily in relation to land rehabilitation, however environmental impact assessments and the Diamond Area Community Development Fund (DACDF) were also mentioned as policies that did not seem to meet expectations of development.

Partnership Africa Canada and Global Witness Publishing Inc. (2004) noted this and pointed to the introduction of the 2003 Core Mineral Policy with hopeful intentions to improve environmental accountability. Eight years later, while there is greater consistency and documentation in ADM, there were still significant gaps in execution of the laws, particularly around environmental management.

Finding 2: Miners' Lack of Agency

Many people are unaware of their rights in a landscape with changing laws and they feel powerless to change anything on a policy or chiefdom level. Community members feel extremely limited in making any decisions about land use due to paramount chief determination of land use and government control of mining concessions. This finding reinforces what Roy Maconachie applies to the conflict in Sierra Leone (, – a "grievance thesis" – describing an environment of which "customary institutions regulated by chiefs… have long been the cause of great inequality and division in rural areas" Maconachie 2012, 264). Every chief governs a bit differently; in one case I met a Paramount Chief who had a strategic development plan for his chiefdom and took the majority of his meetings in public; in another case the meetings were private and the Paramount Chief was often away from the chiefdom. Given the chiefdom's role in controlling property rights, land use, and managing social structures, as well as chiefs elite status and life time appointments makes the act of disagreeing with or speaking against a chief enormously challenging (266).

Finding 3: Limited understanding and capacity to act on environmental issues

Many people see environmental health as key to community development, as land is viewed both in economic and cultural terms. Many have a sense that what they are doing is destructive, but the mechanism for destruction and degradation is less well understood.

"Indeed, some of us that can in fact explain this, but we need to educate others that the loss of water is not because our ancestors are annoyed with us, it's not because of transitional reasons, it's directly because we are losing our forest and this is affecting the water cycle." - Town Chief

Environmental understanding and planning is inconsistent and limited among the adult and young adult population. Environmental impact assessments, where conducted, are not visibly translating into impact mitigation or minimization.

"The way mining is going on, if it continues the way farming is going on then in 10 years from now, I think it will very difficult to see a green leaf. Most parts of the land will be covered only with grass, grass plants, some will be devastated and be vegetable field. Maybe we will begin to experience semi-desert if it continues as it does." - Town Chief

Finding 5: Mining is a gamble, agriculture is an investment

Agriculture is the most referred to livelihood in the region. Many individuals subsist off a combination of mining and agriculture. People supplement agricultural income or try their luck when a new deposit is discovered, or an unfortunate event that requires additional income, known as "Shock-pull" (Appendix 8). Mining is not considered a dependable consistent form of income and is generally recognized as a risk.

"Mining can deceive you but the farming can never deceive you … you are finding a diamond you don't know where the diamond is, so you can mine here you can mine here you cannot be able to receive diamond, but agriculture will never let you down." - Miner

"He decide to plant cocoa because of a long way benefit, like diamond will finish but plantation will remain forever, so that we keep help the community for better future."
Community member, land owner

Finding 4: Substantive environmental changes are affecting economic advancement

While the land is generally considered fertile, the soil has changed. Compost and fertilizers now have to be applied and in certain cases, farmers have to dig out the existing soil and replace with replenished soils before planting. Given the experienced soil degradation, there is widespread increase[16] in use of pricey fertilizers while agriculture outputs remain steady.

> *"No don't have problem with that, - when you want to do agriculture, want to do the farming, like the swamp, you won't have any fertile ground, because they destroy the land, don't have the fertile land the flat land because the land is so mixed, they one down and the one up, just mixed them up, yes."* - Community Member

> *"Well we had SLSD so many years ago, we then have NDMC these are all mining companies that came in and turned the soil over. So the black soil that would have been used for agriculture has been turned upside down, we can't use it for now. Once we have people like you to come in and give us fertilizers and, but we don't have."* - Town Chief

> *"Lack of land rehabilitation proves the biggest barrier to environmental health in the region. Policy is not being implemented and nobody is being held accountable (Questionable mines monitors). The soil is flipped creating a need for greater expertise to move from pit to agriculture."* - Miner

This becomes cyclical as more people see the need to move to agriculture, yet agriculture has become less reliable due to environmental degradation associated with ADM.

[16] This increased usage was told to me anecdotally. I do not have specifics on the increase in fertilizer use or the costs associated with this increase in use.

Finding 6: People feel stuck in and by mining

Many are ready to pursue livelihood options beyond diamond mining, however are faced with lack of opportunity due to limited training, literacy, and opportunities in the rural diamond mining regions.

> *"We are mining just because we don't have a job that we can attach ourselves too, that's the main reason we are mining, some of us are students some of us dropout lack of financial support."* - Miner

> *"My father and my mother are farmers, but… I'm a drop out [of school], if I had skilled job to train, I would like to learn the job." – Miner*

Miners and diggers, compensated through wages or a percentage of winnings, engage in mining for monetary gain. This finding reflects a greater sense of being confined and lacking control than that expressed in earlier research in the region (Partnership Africa Canada and Global Witness Publishing Inc. 2004, 14). There are many reasons that this might be the case, including lower diamond prices, bias in the research that I conducted, and more years of war recovery with little economic progress, among others.

Finding 7: Mining is generally viewed as being detrimental, not a net benefit

Despite the nearly 85-year long history of diamond mining in Sierra Leone, and that mineral revenues are a major part of the national revenues, on an individual and community level, mining is largely viewed as having net detrimental effects for the local or regional populations.

> *"Well, mining is not so much because it has not done so much good for us at all, all these diamonds are taken away by all these, other people who came – Lebanese, Israelis, name them. So the local persons have not benefited at all."* – Village Chief

SECTION 4:
DISCUSSION

These seven findings provide insight into current environmental awareness, practices, and attitudes of affected populations to identify ideas, interest, and current capacity for small changes at the individual, community or artisanal mine level, in service of improving the social, economic, and environmental wellbeing of diamond miners and their communities. From the findings, three critical takeaways emerge to bolster current diamond related programs (See Appendix 8 for a list of some past and current diamond projects), to build on non-diamond development programs, or to model new programs in order to improve the social, economic, and environmental wellbeing of diamond miners and their communities. None of these efforts would be effective without the involvement and partnership with the community, so community collaboration would be a precursor to any ground level effort.

Takeaway 1: Work Directly With Supporters

Interventions have occurred around rehabilitation, licensing, and revenue distribution – but there is great opportunity for the supporter to be a point of leverage. Given the control that the financial supporter has in dictating operations norms (Finding 1), wages, timelines and profit sharing, they can (and arguably, they must) be a critical gateway to improving practices.

Takeaway 2: Employ Simple Operations Interventions

Developing a direct relationship with the Supporter could potentially open the opportunity to affect operations of the mine itself and offset any switching or additional costs[17]. Due of the varied understanding of environmental science (Finding 5), and need to address some of the real issues associated with ADM (Finding 4), simple changes could be

[17] In subsequent work, outside the scope of this Master's Project, I outline procurement details and model the costs for these operational upgrades.

implemented to reduce environmental degradation. While there are a variety of different approaches (Butler 2014, 53) that might be a applied depending on what is appropriate for each situation, one primary way to do this is through the CEMMATS' SMARTER Mining Method (see Appendix 10) of progressive land reclamation or concurrent backfilling, which extracts in a trench system and refills the land as mining progresses and is safer than traditional ASM techniques (61). This system can include a separate pile for the nutrient rich top soil (locally known as "black soil") in order to use it as the top-layer once the overburden has been replaced. This methodology has been encouraged and taught by DDI and PRADD. Additional measures to reduce erosion include the use of a closed loop system for water use in which a holding pond for discharged effluent also serves as the source for ongoing water use.

Recommendation 3: Focus on Income-Generating Land Rehabilitation from the Outset

Developing post-mining income generating plans addresses the greatest environmental (Finding 4) and economic challenges as many are looking for livelihood options outside of mining (Finding 7). Land rehabilitation mitigates negative impacts and provides benefits to water quality, land availability, habitat protection, and community health and safety (Butler 2014, 2). Past initiatives have established that land rehabilitation can be effectively leveraged into income-generating, environmentally restorative activities. "Frugal rehabilitation" models methods designed for "economical affordability, social acceptability and ecological viability" (2), which would be critical in this region. Beyond the rehabilitation of mine land into agriculture, Central African Republic's Post-Mining Income-Generating Environmental Rehabilitation (POMIGER) (DeJong 2012, 7), demonstrated a net-positive manner in which to transition abandoned mine-land into fish ponds. If planned in advance of the mining operation and if engaging directly with the supporter, this full mine-site, lifecycle approach could be formalized into the memorandum of understanding that includes the Paramount Chief and is contracted between the license holder, the community and the financial supporter. Full community engagement in an initiative such as this would increase the likelihood that land would not be re-mined, post rehabilitation.

CONCLUSION

Diamond miners and their communities have been stuck in a cycle of poverty and degradation, directly feeling negative impacts of ADM yet lacking resources to pursue solutions. Now, with increasing consumer interest in product transparency and growing desire for products with a social and environmental impact (BBMG 2014), this is an exciting time to pursue in those ground level efforts that manifest the unique potential that artisanally mined diamonds hold to improve the lives of those in impoverished mining regions. A conjoint analysis of consumer preferences on the diamond retailing side could be an enormously productive next step to identify the consumer appetite for and revenue-generating potential of fairly produced diamonds. This report provides insight into the experience and perspective of artisanal miners and their families to inform members of industry, society or government who are or might be interested in pursuing development efforts related to ADM in Sierra Leone. The takeaways suggest a prioritized approach to effectively implementing ADM-based development efforts that can be quickly implemented and scaled in a decentralized manner. As many miners feel a lack of control over their situation, such localized efforts could complement national and international initiatives for development in Sierra Leone and beyond.

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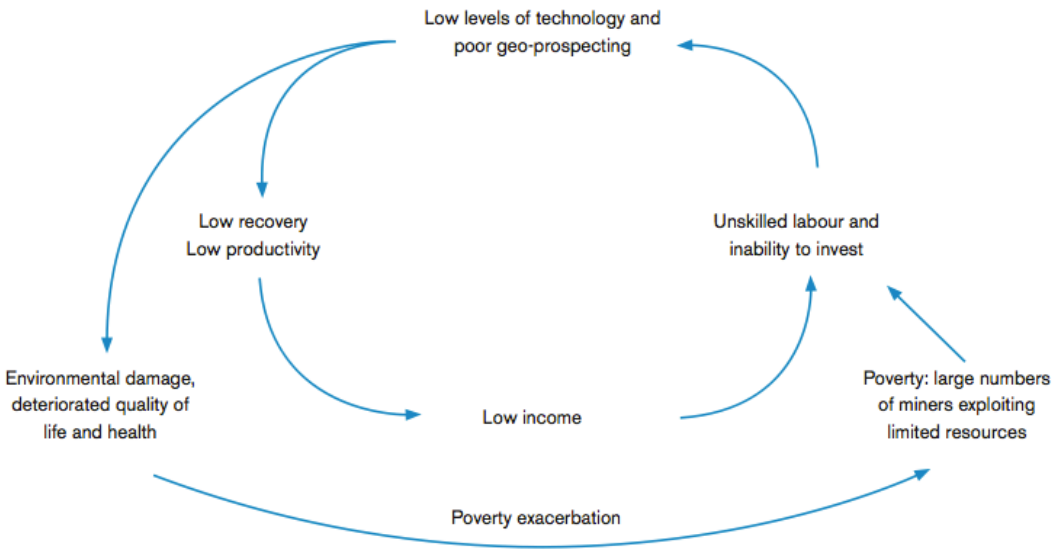
APPENDIX 1: Maps of Sierra Leone

Map of Sierra Leone, Africa (CIA 2014)

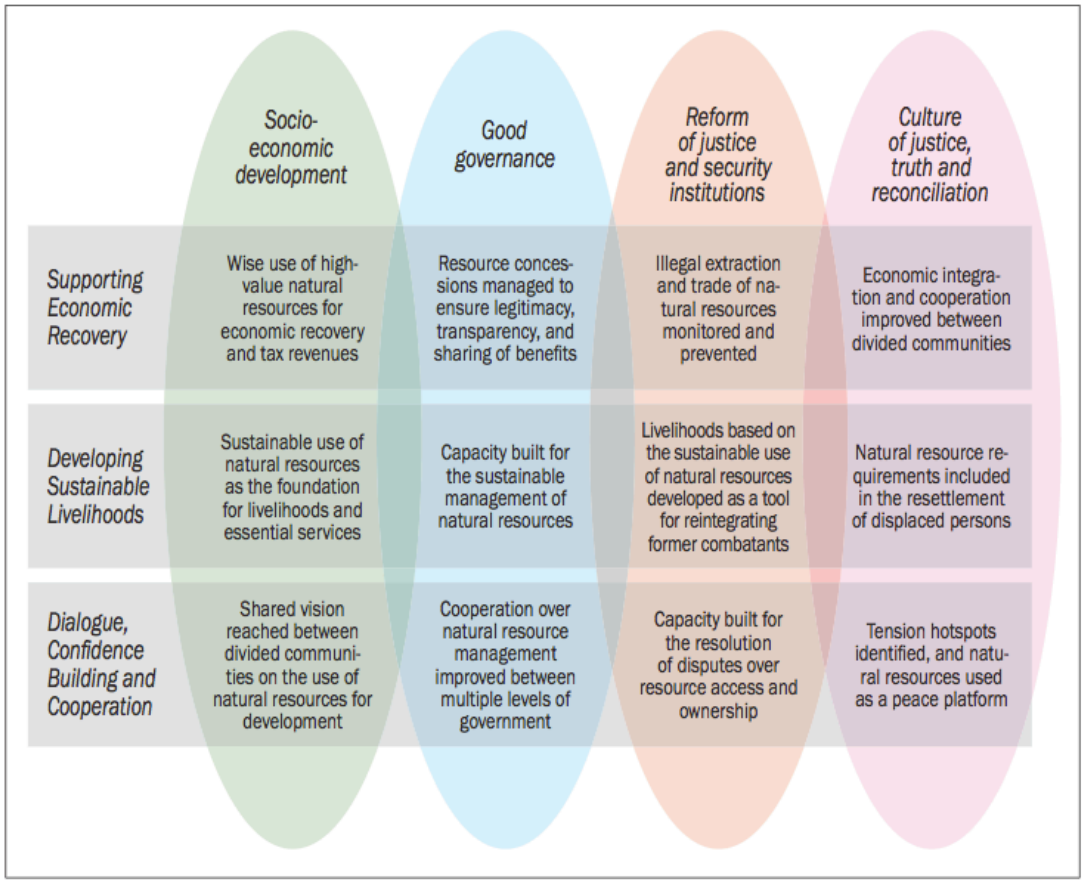
Map of Sierra Leone (UNEP 2010, 12)

APPENDIX 2: The ASM Poverty Trap



Source: Barry 1996 modified in Hilson 2012

APPENDIX 3: Natural Resources Play a Key Role in Peacebuilding (UNEP 2010, 67)



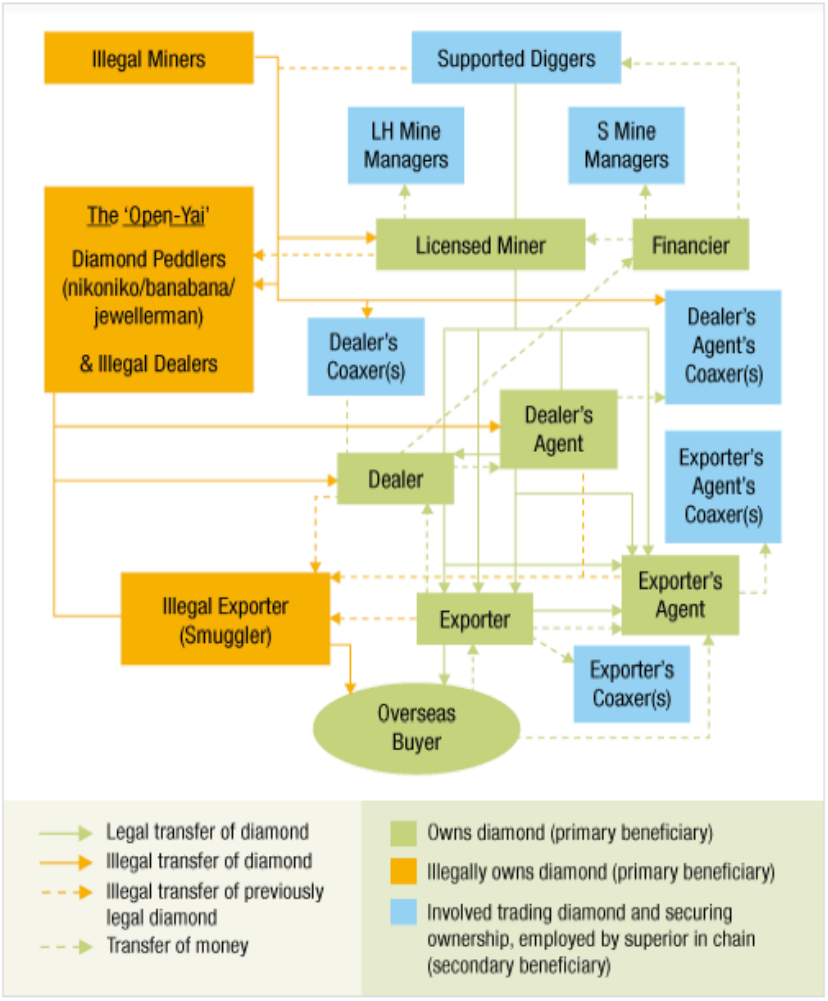
APPENDIX 4: Notes on Lack of Available Data

"While natural resources make up the backbone of the Sierra Leonean economy, accurate and timely data on the actual extent of resource reserves, movement and long-term prospects are visibly lacking. As is the case for West Africa generally, no definitive public study has been undertaken to assess the current potential value of Sierra Leone's mineral reserves and their accessibility. Indeed, no comprehensive government mineral survey in Sierra Leone has been undertaken since the early 20th century. Expectations ride high on the minerals sector, and there is a need for data that can identify a realistic economic role for the sector.

"The war also destroyed many official records, as a result of displacement and from damage sustained during the fighting. This has led to a trend of land grabbing, particularly in the Western Area, with people building first and second homes on land that is in many cases dubiously claimed. The building has come at enormous cost to the local water and forest systems, as well as the integrity of ecosystems vital for the tourism industry. In many cases, records for this and other sectors are difficult or impossible to locate, exacerbating the problem" (UNEP 2010, 54).

"There is a large amount of practice-informed knowledge in the ASM sector…However, much of it is neither written down nor publicly shared…The failure to capture this 'citizen-knowledge' perpetuates uncertainties on both structural challenges and potential policy innovations for ASM…This knowledge needs to feed into national policy and institutional improvements to achieve change 'on the ground' but also international industry initiatives and international sustainable development initiatives, where ASM is currently poorly represented" (Buxton 2013).

APPENDIX 5: DDI ADM Chain in Sierra Leone (DDI.org 2014)



APPENDIX 6: Comparison of Mining License Categories (MMR 2009b)

	Artisanal Mining	Small-Scale Mining	Large Scale Mining
Application	• Apply to Director of Mines, or delegated official in the region • Approval based on complying with clear requirements • Only Sierra Leonean citizens can hold licence (individuals, partnerships, cooperatives, or body corporates) • Must specify mining method • Environment Management Plan • Proof of financial and technical capacity	• Must specify mining method, environmental impact, forecast investment, procurement, infrastructure requirements • Application certified as legally compliant by MAB and approved by Minister • Applicant must acquire environmental licence (requiring EIA and EMP) • Companies, partnerships and cooperatives must have 25% Sierra Leonean ownership	• Must define resource, prepare full financial plan, specify mining method, environmental impact, forecast investment, procurement, infrastructure requirements • Application certified as legally compliant by MAB and approved by Minister • Applicant must acquire environmental licence (requiring EIA and EMP) • Locally incorporated companies (no restriction on nationality of owners)
Maximum Area	1/2 hectares (5,000sqm)	100 hectares (1 sq km)	250 sq km
Duration	1 year, renewable 3 times	3 years, renewable for 3 year periods	25 years, renewable for 15 year periods
Operations	Open pit, up to 10 meters deep	Up to 20 meters deep, no underground operations	Any safe and responsible mining method
Obligations	• General duty to protect environment, and workers health and safety • Rehabilitation fee	• Must comply with conditions of environmental licence • Must provide financial assurance for environmental compliance • May be required to enter into Community Development Agreement	• Must comply with conditions of environmental licence • Must provide financial assurance for environmental compliance • Required to enter into Community Development Agreements with affected communities

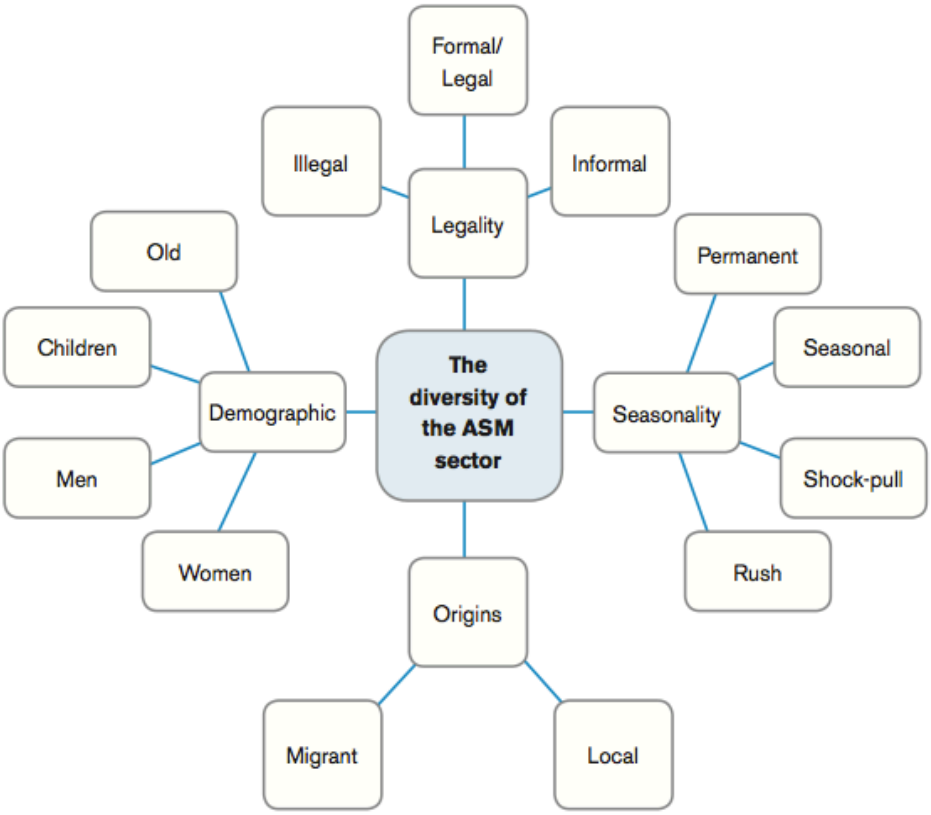
APPENDIX 7: Past Diamond-Based Development and Environmental Initiatives

Initiative	Goals	Support/Actors	Outcomes/Status
Peace Diamond Alliance (PDA) (Temple et al 2006, 3)	Improve diamond management and business at the local level through cooperation among government, civil society, and business.	A Sierra Leonean organization, Supported by the Government of Sierra Leone (GOSL), USAID and companies, Rapaport, DeBeers	The PDA initiative lasted from 2002 - 2003. Funding was not allocated for ongoing efforts, and business was not able to sustain itself.
Diamond Area Community Development Fund (DACDF) (MMR 2011)	Returns .75% of the countries 3% export tax revenue the GoSL receives from legal artisanal diamond exports to enhance social and economic development in diamond mining communities.	Chiefdoms, GoSL, Artisanal miners	There was concern that money is inappropriately and unjustly allocated due to lack of awareness of the funds, however millions of Leones have been allocated.
Community Development Fund (NRGI 2014)	Requires large a and small scale license holders to return .1% of annual gross revenue to the surrounding community and requires operators to reach agreement with affects populations.	GoSL, Community members, Large and small-scale license holders	Unknown
Integrated Diamond Management Program (IDMP) (NRGI 2006)	To improve local incentives for clean diamond management, enable local communities to benefit from the diamond resource, and to assist the Government of Sierra Leone (GoSL) in its effort to manage this critical resource.	International organizations, e.g., Global Witness, Management Systems International (MSI), GoSL, miners, USAID	Generally it was believed to perform well, however the program received funding from USAID and had to stop when the funding and timeframe was complete.

UNEP Sierra Leone Strategy to support the GoSL's "Agenda for Change" and development of the Sierra Leone Environmental Protection Agency (EPA-SL) (UNEP 2010, 84) *Ongoing*	UNEP's 2010 technical report "Sierra Leone: Environment, Conflict and Peacebuilding Assessment" guides activities to sustainably manage natural resources in ways that contribute to peacebuilding efforts, conflict prevention and transboundary cooperation.	UNEP's Post-Conflict and Disaster Management Branch has been working very closely with SL-EPA, as well as other governmental offices (Division of Forestry, Ministry of Agriculture, Strategy and Policy Unit) and NGOs (Foundacion Futuro Latinamericano, Environmental Foundation for Africa, International Institute of Sustainable Development) to build capacity and implement plans on the ground.	As of Fall 2011, UNEP and government officials continue to move forward on these initiatives with great hope, yet there is concern around the slow rate of development.[18]

[18] Personal conversation with then UNEP Sierra Leone, Environmental Affairs Officer, Oli Brown, November '11

APPENDIX 8: Diversity in Poverty-Driven ASM (Buxton 2013, 4)

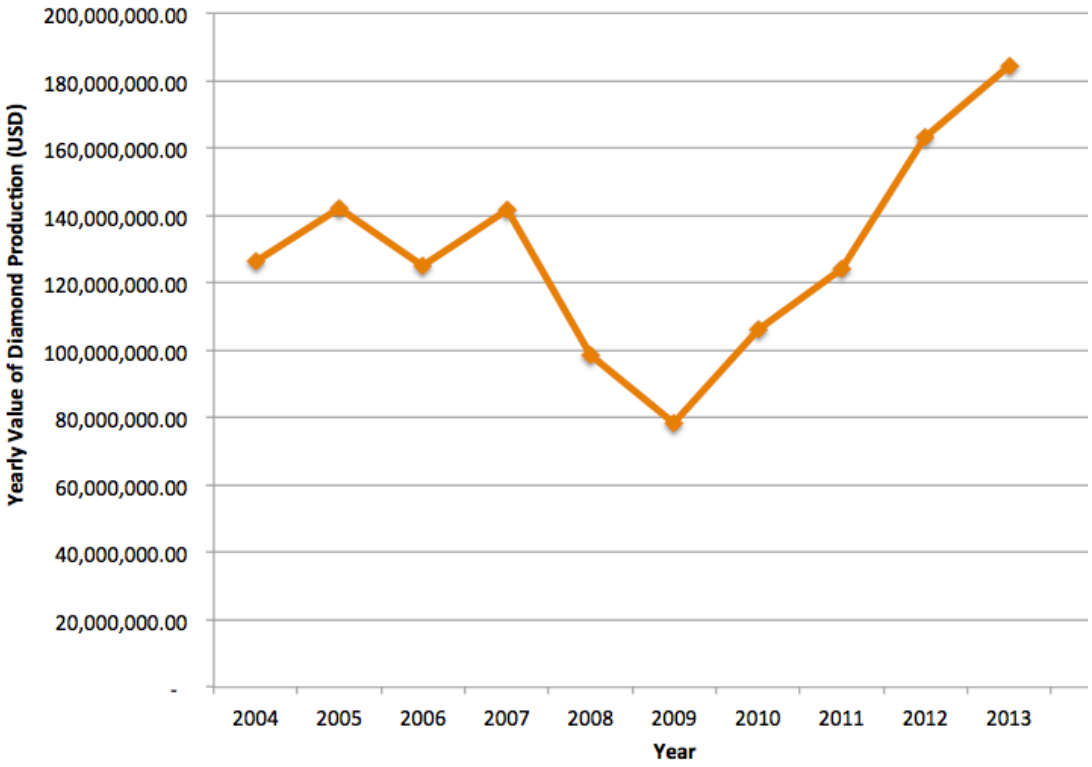


APPENDIX 9: Sierra Leone's Legal Diamond Production

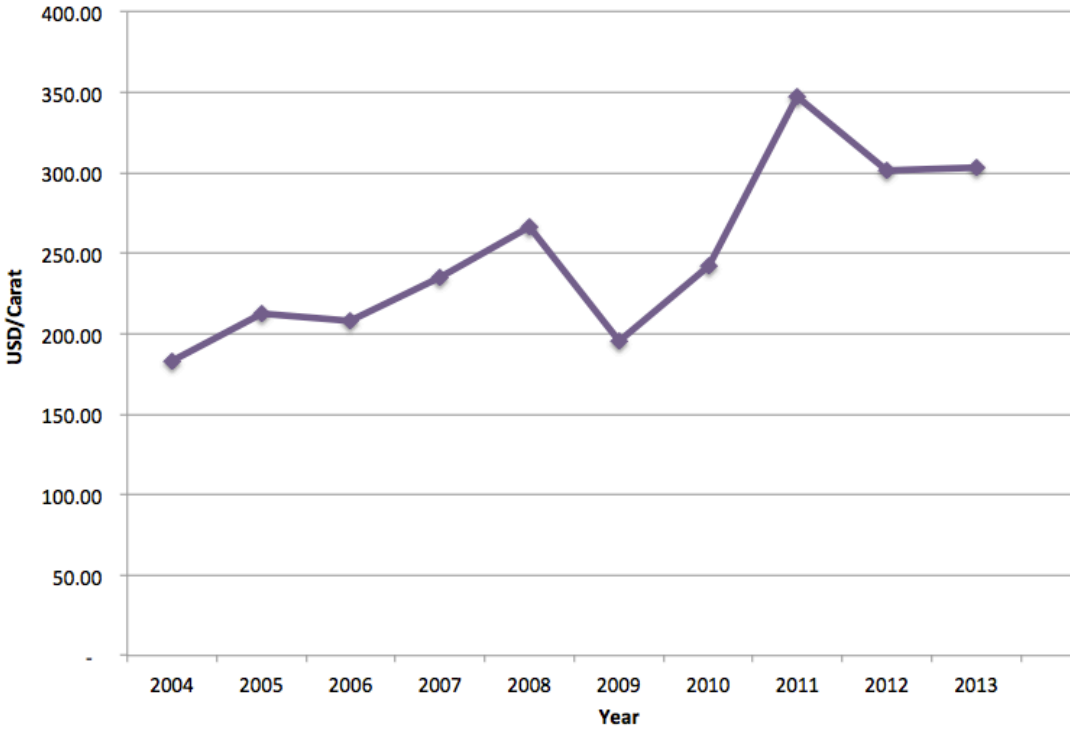
Legal Diamond Production 2004 - 2013 (KPCS 2014b)

Year	Carats	Production Value	USD/Carat
2004	691,756.92	$ 126,652,634.26	$ 183.09
2005	668,709.57	$ 141,940,243.85	$ 212.26
2006	603,566.07	$ 125,304,842.46	$ 207.61
2007	603,623.04	$ 141,565,685.21	$ 234.53
2008	371,260.95	$ 98,772,170.78	$ 266.05
2009	400,842.98	$ 78,423,595.09	$ 195.65
2010	437,516.09	$ 106,062,932.98	$ 242.42
2011	357,160.97	$ 124,150,581.01	$ 347.60
2012	541,165.66	$ 163,196,193.41	$ 301.56
2013	608,955.35	$ 184,482,656.63	$ 302.95
Total	5,284,557.60	$ 1,290,551,535.68	$ 244.21

Yearly Production of Diamonds 2004 – 2013 (KPCS 2014b)



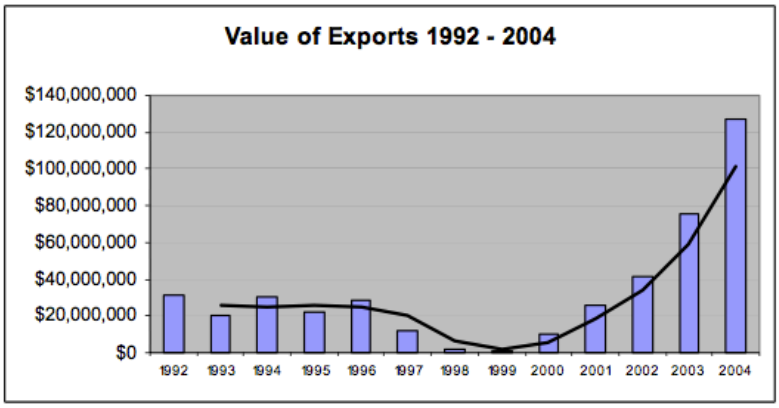
Change in Value of Diamonds in USD/Carat (KPCS 2014b)



Value of Sierra Leone legal Diamond exports: 1992 - 2004 (Temple et al 2006)

The following graph tracks the decline in legal exports as the war began and indicates how dramatically greater legal exports are now than at the beginning of the war.

Figure 4: ***Value of Sierra Leone legal diamond exports: 1992-2004***

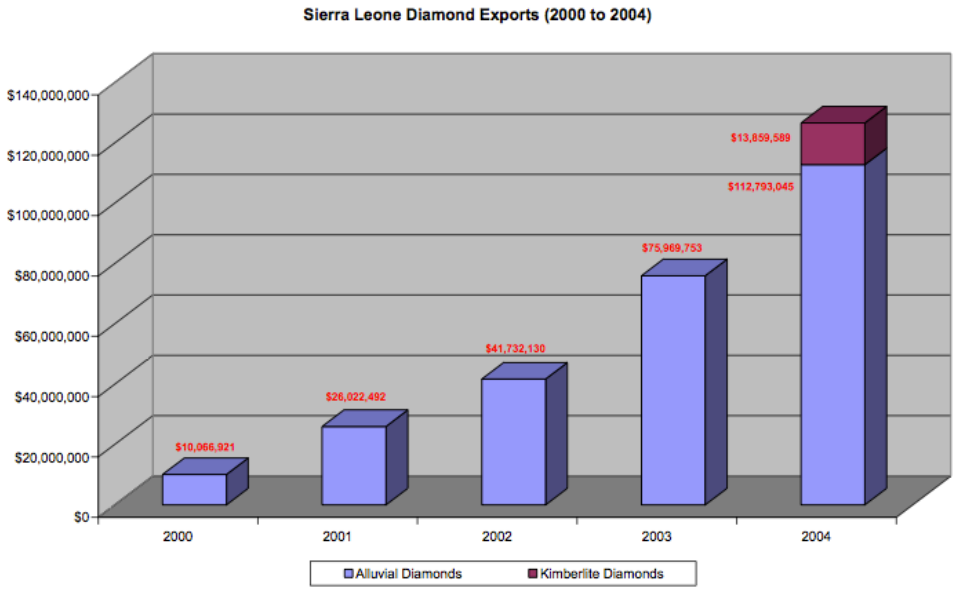


USD Value of Sierra Leone diamond exports: 2000 - 2004 (Temple et al 2006)

(Reflects the introduction of kimberlite diamonds in 2004)

Those exporting diamonds have also increasingly marketed production legally since the war, as shown below:

Figure 3: ***USD Value of Sierra Leone diamond exports: 2000-2004***



APPENDIX 10: SMARTER Mining Method (Butler 2014, 61 – 63)

FIGURE A2: Prospecting Pits

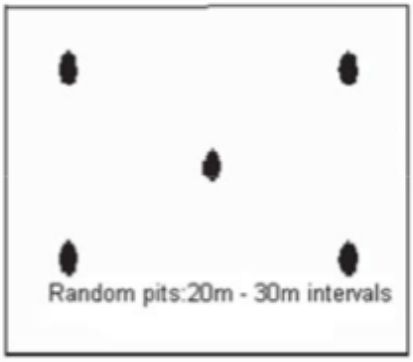


FIGURE A3: Dig the first trench and place the overburden to the side of first trench. Set gravel aside for washing

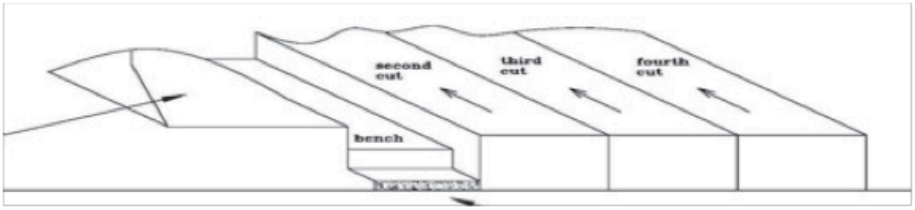


FIGURE A4: Dig the second trench and place overburden in the empty first trench

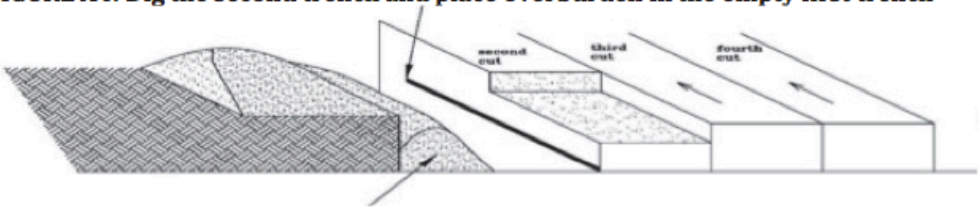


FIGURE A5: Mining in a swamp: build a fence using wooden pegs and palm branches to prevent overburden from sliding into the trench being mined

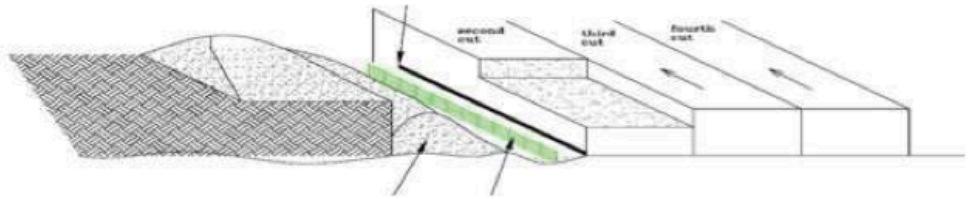


FIGURE A6: Continue digging trenches, backfilling empty trenches, and stockpiling gravel for washing, until the area has been fully worked

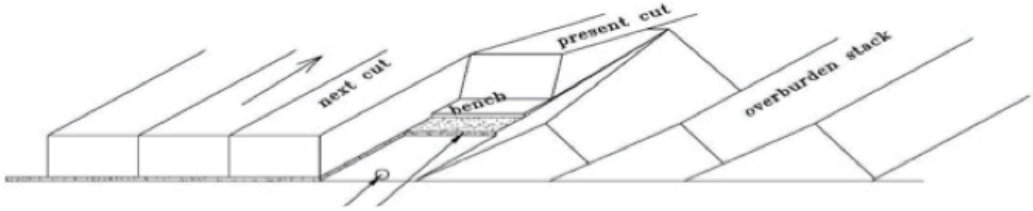


FIGURE A7: Reclaim the mined out area with overburden from the first trench